MEMORANDUM FOR: [redacted] STAT

First Cut at C.C.C - D.O.

I intend to expand section 4.2.1 somewhat and add a section 4.2.3, "Photo-Scientific Tasks" after talking with APSD. (I have a rough outline for the latter.)

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FORM NO. 1 AUG 54 101 REPLACES FORM 10-10 WHICH MAY BE USED.

(47)

D R A F T [redacted] STAT
12 February 1970

DEVELOPMENT OBJECTIVES
COLOR CONTROL CELL

1. INTRODUCTION

These development objectives describe requirements to be met in the preparation of a Design Concept for a Color Control Cell, a facility to provide operational photo interpreter and photo-science analysts with the capabilities to perform accurate color discriminations while analyzing high resolution, color reconnaissance photography ~~taken~~ at very high altitudes.

2. BACKGROUND

2.1. As a result of ~~great~~ significant improvements in the imaging characteristics of ~~original~~ reversal color positive film in recent months, increasing amounts of color such reconnaissance film are being flown ~~at high altitude~~ for the assessment of color ~~Essential~~ -oriented target information Elements of Information (EEI's) in military reconnaissance. This trend is expected to accelerate in the next several years, as development continues on ~~presently~~ less-than-optimum improved copy film for reproduction of working copies. It is anticipated that product improvement of both color original and color copy material--as well as special unconventional sensor records--will continue, necessitating continued R&D effort in several categories of color reconnaissance film utilization.

2.2. Specifically, several initial studies are starting in the areas of: (a) Establish~~ing~~ment of processing, viewing, and reporting standards for color-oriented Essential Elements of Information (EEI's); (b) Develop~~ing~~ment and modif~~y~~ication ~~ing~~ of equipment to permit optimum copying of photographic color originals; (c) Analyz~~ing~~Analysis of the effect of the new color film structure on the continuing require-

ment for accurate mensuration of photographic images; (d) Developing a plan for training all types of personnel who must exploit color photography.

2.3. Progress and findings in each of these studies must be correlated with the Design Concept for the Color Control Cell (CCC). Similarly, the contractor for the CCC will be required to coordinate with the continuing efforts of the manufacturer of the new high resolution color films which involve unique coating and arrangement of film layers. As time goes by, additional studies will be added, demanding further coordination among contractors, under the control of Government Project Officers.

3. CONCEPT

3.1. Purpose - It is the purpose of this study to develop a Design Concept for equipments and techniques appropriate for use in accurately identifying colors on aerial reconnaissance film for subsequent analysis. Secondarily, the Design Concept for the Color Control Cell shall be consistant with eventual use of the cell for research into human factors and other considerations in scanning, interpreting, and analyzing current and future color film products.

3.2. Scope - This study is intended to produce a complete Design Concept for a facility with which to, first, identify film colors and, second, study the effect of manipulating the environment and illumination of viewing aids. This study shall produce a thorough report detailing the results of the contractor's analyses and tests of breadboards (as necessary), and defining, in general terms, the physical and functional characteristics of the Color Control Cell and equipment therein. Subsequent phases of this effort will include Detailed Designs, Modification and Fabrication, and Test--under revised contractual arrangements, likely to include extensive subcontracting.

4. REQUIREMENTS

4.1. Color Identification

4.1.1. Standards - The selected contractor will coordinate with a parallel effort (under way by the Sponsor) to establish a system of standards by which photo interpreters can identify image colors. A method utilizing the [redacted] Color System, modified for transparencies, is being considered; however, measurement techniques involving Chromaticity Coordinates, Spectral Power Distribution, Color Rendering Indices, and Luminance values are also believed necessary. In this way, the Sponsor is planning to start from ~~a~~ base STANDARDS defined recently by USA standards for viewing and comparing color transparencies in the Graphic Arts and related industries. From that base, appropriate modifications will be applied for dealing with any special requirements for photo interpretation and photo-scientific analysis. The latter requirement involves special investigations to define the performance of ~~individual~~ specific reconnaissance ~~system~~ missions. ~~and we believe the differing tasks indicate~~ It is probable that a second Color Control Cell will be needed for those purposes only.

4.1.2. Visual - It is anticipated that color identification to varying tolerances will be required as a result of establishing standards for viewing and reporting on color EEI's. Therefore, various equipments for making color identifications may well be necessary in with the subject facility. The contractor for the Design Concept should consider the possibility that many practical color identifications may be feasible with a so-called Visual Tri-Chromatic Colorimeter. Such a device may simply be a modified split field microscope, which could, in effect, contain its own Color Control Cell within itself, thus making it possible for the photo interpreter to carry the Colorimeter into the photo interpretation area. Such a device (which has already been described to this

office) would require some means of calibrating the illumination of the standard sample portion of the viewing system with the presently varying color characteristics of PI light tables used for assessing the reconnaissance film.

4.1.3. Photo-Electric - A second, higher level of tolerance for color identifications may require the development of a Photo-Electric Tri-Chromatic Colorimeter. While portability of this device might be desirable, presumably less frequent need for this equipment might indicate a central location within a Color Control Cell, with work flow directed to it. A highly precise Spectrophotometer may also be necessary for some percentage of color identification tasks. Certainly, such equipment would not be portable, but would be centrally located. The contractor must consider all of these concepts, but not be limited to them in developing the overall Design Concept. A thorough technology review is indicated, as well as close coordination with the Sponsor's photo scientists and contractors working on related studies.

4.2. Color Control Cell

4.2.1. Color Identification Within the Cell - If it develops that devices cannot be used directly in PI areas for color identification, it is believed that such a "production" function must be developed and tested within a facility in which the walls, ceiling, floor, and work surfaces are optimized as to color and reflectance. Environmental illumination should be similarly optimized. In such a facility, the instruments for displaying color film and making the necessary color identifications may be related to such devices as the Macbeth T&R 240 and PLT-510 or may be modified versions of existing PI light tables, microstereoscopes, and projection viewers.

4.2.2. P.I. Experimentation - With these same "working instruments" the Color Control Cell must be usable to conduct meaningful human factors experiments to define and develop optimized techniques for interpreting the new families of color reconnaissance films. To achieve such purpose, it may well be necessary that the illuminations (both environmental and instrument) be "modifiable" as to color characteristics. Similarly, work space configurations and colors may have to be convertible to permit testing of theoretical arrangements. This application of the Design Conept is expected to be of continuing benefit as new films and techniques for exploitation are developed.

4.3. Coordination

4.3.1. As stated above, several on-going studies will demand coordination (through Government Project Officers) among various contractors and consultants employed by the Government. Free and open-exchanges must be maintained to promote effective results.

4.3.2. A rather specialized type of coordination must take place between the selected contractor and another, currently preparing computer programs that "match" or predict image and ground colors on a theoretical basis. This implies extension beyond merely "identifying" colors on film and must be investigated for potential application to the "communication or reporting" function of a "production" facility for color identifications.

4.3.3. Special clearances will be necessary for key personnel of the selected contractor to permit entry into the Sponsor's facility, other contractors' facilities, and eventually, other Government offices, which are candidates for their own Color Control Cells. It is anticipated that a network of such cells may be established for rapid and accurate communication of color EEI's between common users.

5. MISCELLANEOUS

5.1. Reporting - The contractor will be required to provide monthly reports and a Final Report. The monthly reports will follow the DB-1001 specification attached. The Final Report will provide a complete Design Concept, upon which a follow-on Detailed Design can be directly based. The Final Report must be completed within 30 days of the completion of the investigations and within the allowable cost of the contract.

5.2. Proposal Format - The submitted proposal will conform to the attached Guide for Proposal Format.

5.3. Level of Effort - It is desired that this study consume no more than four months from contract initiation.

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